The Memory of Iron: African Technology in the Americas

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Metallic microstructures are complex, yet there is a certain order to them, with a nice balance between order and disorder… Anything complex *must* have had a history, a sequence of changes in its parts.(1)

The history of iron in the New World reveals the complexity, order, and disorder of the American past. For more than 300 years, the iron chains of slavery held together an Atlantic world that interconnected the peoples and destinies of four continents: Africans, Europeans, Asians, and indigenous peoples of the Americas. But the memory of iron unleashed both destructive and creative forces. Iron technology provided not only the chains of slavery, but also the tools of plantation and empire. That technology derived not only from the experience of Europeans, but also non-Europeans. The way in which the transfer of African technology imposed cultural and physical changes on the American landscape is the subject of this paper. Particularly, the technology of African iron helped maintain a set of African-derived cultural values, provided an ideology of resistance, and resulted in distinctive patterns of land and resource use.

African Iron Technology: Ancestors, Spirits, and Steel

Throughout the period of the Atlantic era, making iron remained a charcoal-based technology in which spiritual and material realms were indistinct. Smelting and smithing in West and Central Africa were activities in which men were empowered as leaders and through which objects of empowerment were created by technological performance. The source of that power was not merely linked to the material world. Non-material realms are essential parts of the landscape of iron. Through ritual, iron took on meanings and values that explain its potency for the empowerment of individuals and groups. Iron's potential for transformation gives it a sacred status. For the Yoruba and many other peoples of along the Guinea coast, the qualities of iron are a manifestation of its *ase*—its metaphysical energies. Any time two pieces of iron come together, that is Ogun, the Yoruba warrior deity associated with iron and the embodiment of its powers. Beliefs about Ogun reflect the dual capacity of iron to be both destructive (swords, cutlasses, knives) and beneficial (hoes, axes, and other tools).

For the Yoruba, the sites of smelting and smithing were shrines where Ogun existed. Henry Drewal describes the ritual through which human hands, minds, and voices transform a natural substance into a functional, "living" artifact. Sacrificing a cock and saying invocations at the site of a smelting furnace, the smelter celebrated both the dangers and the success of the operation. Thus, according to Drewal, "through ritual, humans shape, control, and change raw power into socially useful power."(2)

The places of technology and its memory are places linked to ancestors in Africa. Furnaces and smithing sites make reference to ongoing genealogical connections. For example, at the site of Banjeli, Togo, where large-scale iron production once supported hundreds of smelting furnaces, the descendants of smiths and smelters remember the generations of sites where their ancestors smelted.(3) During the 1983 reconstruction of an iron-smelting furnace, the master smelter Tandja Najomba called the ancestors to "come and build this furnace." He removed pieces of the old furnace (what westerners would perceive as an archaeological site), and then incorporated them into the walls of the new, clay structure. Thus the artifact became a "placeholder" in the technological and historical

processes of reconstruction. The furnace he was building would become a living, breathing female body, invoked by the smelter to "give birth to good iron."

How smiths and smelters in African societies remembered technological processes is as important to the issues of place and cultural memory as it is to the diffusion of technology. Iron technology was a performed activity in which highly ritualized bodily practices persisted across generations. These practices were transmitted using systems of apprenticeship and restricted access to technology. Activities were controlled by the ancestors and spirits, and they communicated essential values and concerns common to the larger group. According to Terry Childs, "these messages were sent not only to the living, but to the spirit worlds as well."(4) Smiths and smelters used rituals to remember sequences of actions in the complex technical processes of transforming stone to metal, and shackle to spear. In this way, the Yoruba warrior deity of iron, Ogun, accumulated a disproportionate amount of power during the Atlantic era—an era, in turn, characterized by such transformations. The links between historical memory and technological performance provided the meaning and the impetus for action in the Atlantic world.

Technological style best expresses the design decisions and processes, as well as products, of African metallurgists. Over time, these decisions and behaviors acquired patterns because they were of fundamental importance in communicating aspects of culture. Remembering the embedded cultural components of iron technology also explains the role of blacksmiths in major historical changes. During the Atlantic era, iron imports gradually replaced local production. This was usually not because the European products were superior. Rather, substitutions were rarely ones of high quality iron in exchange for inferior products. Despite the myth of the backwardness of African technology, African industries often competed successfully with European imports, and blacksmiths were often astute and ambitious entrepreneurs. But African industries were charcoal dependent, and access to preferred sources of fuel was severely restricted by colonial control over the landscape, and by the patterns of use over centuries that had depleted available ore and preferred species of trees used in charcoal production.

Across the African continent, complex systems of iron production still provided weapons for war, agricultural implements and tools, currencies, and culturally relevant prestige objects, and offered their practitioners a potent stage for social, political, and economic interactions. Products ranged from mild carbon steel to wrought iron. Smiths and master smelters successfully utilized imports of a staggering variety of quality and composition. They also sustained industries that were totally self-sufficient, thus allowing periods and conditions of resistance to the European forces of underdevelopment. During the creation of the African Diaspora, these industrial activities translated African-derived values onto the American landscape as blacksmiths, ironworkers, and charcoal makers peopled a new continent. Not only their labor, but also their ideologies spread from West and Central Africa through the Diaspora.

The Transfer of African Iron Technology

Africans and Europeans alike transferred their technology and other cultural expertise across the Atlantic during the era of the slave trade. They did so in an era in which iron ruled the seas. Even before iron-clad hulls and steamships, the spirit of Ogun was onboard West Indian sailing ships. Aside from the necessary tools on voyages, every ship had a blacksmith among its specialist craftsmen, and he was often among the highest paid. The ship's ironwork "required the constant attention of the skilled craftsmen who comprised much of her crew." Between 1728 and 1738, the British technological developments that produced rolled sheet iron, bars, and rods used improved refractory furnaces and a forced air blast. Eighteenth century slaving ships carried cargoes of iron and iron slag, the waste-product of smelting, was then a common ballast.(5)

Once steam powered the great sailing ships, there was no doubt of Ogun's presence. Coal-fired steam power required a fireman or stoker to feed around five tons of coal a day into the ship's fiery furnace. On large vessels at the turn of the last century, about 185 firemen and 100 trimmers, who carried the coal from bunkers, could be employed in a single voyage. Africans were particularly sought for employment on navy ships "in cutting firewood for use in lighting fires, in the engine room and galley, and for distilling purposes." Their participation is recorded in popular sea shanties, in rituals onboard ships, and in the sailor bands found in carnival ashore—from Bahia to Port-of-Spain.(6) In such performance art, the African stoker is portrayed by a costumed dance originally associated with spirit

possession dances of Ogun's devotees. Moreover, this significant level of African participation carried over on to land.

One of the interesting features of iron technology in the Americas is that it remained charcoal-based. In England, and most of Europe, charcoal iron had been systematically abandoned, owing to the scarcity of fuel. In most industries, charcoal had been replaced by bituminous coal. The availability of hardwoods in the Caribbean and the Americas encouraged colonizers to sometimes revert to wood charcoal processes. Africans, both males and females, were sought out for their expertise in the distillation of wood for fuel.(7) At Clifton Forge in Virginia, where a finery converted pig iron to bar iron in 1831, 32 slaves were employed to make charcoal.(8)

Many opportunities existed for the technologies of the Atlantic rim to interact. The exploitation of African metallurgical expertise that had begun onboard the ships that plied the Atlantic world carried over to the industries of the Americas. African labor was commonly required by large-scale smelting and refining operations. But the African component provided more than just slave labor; Africans were sought for their skills and knowledge. Slave smiths worked in fineries, operated hammers, and participated in the management and operation of smelting furnaces. They did so often against the prevailing racial codes, like the ones encountered by John England at Precipio ironworks, where: "all the [a]rguments yet could be used could not prevail with the Gloucestershire finers to admit of a clause to teach Negroes."(9) Yet, within a few decades blacks did work at the very same operations as finers, founders, bloomers, and foundrymen. That they succeeded against prevailing attitudes underscores the value of their contributions.

Once iron technology reached the rural agricultural communities, the demand for ironworking and blacksmithing skills increased. Shoeing horses and repair of hoes, cutlasses, and other tools were two aspects of demand that linked urban markets with rural communities. As Colleen Kriger has demonstrated for nineteenth century Central Africa, ironworkers were particularly adept in reconfiguring social and ethnic identities in this era of great economic upheaval.(10) They did so by negotiating their skills and products across existing spatial and social boundaries. These same skills were put to use in the New World.

Not surprisingly, the slave ironworkers, such as those of Winkle Village, Guyana, were positioned to go on strike for better wages and to negotiate their early emancipation in 1821. Afro-Jamaican metallurgists in the late eighteenth century similarly found ways to use their expertise to negotiate social status. At the site of Reeder's Pen, nearly three hundred African workers provided expertise for the iron and brass foundry site that was established near the Royal Navy's most important island harbor. There they worked iron in a rolling and slitting mill, did casting, and carried out a variety of smithing enterprises. Plans were underway for the construction of a smelting furnace, and for the cutting of local woods for charcoal fuel, suggesting the desirability of greater autonomy, vis-a-vis the sources of pig iron. But this was not to be. Local colonial authorities dismantled and destroyed the industry, in fear of its capture by an invasion of foreign troops. Throughout the following century, the iron and foundry workers, and their descendants, in Morant Bay, Jamaica, provided a constant source of resistance and rebellion after the demise of the industry there.

Changes in the Landscape of the Americas

Iron-working practices required access to water and forests, as well as to sources of ore and metal. Furthermore, furnaces built to serve either African or European enterprises regularly required specialized sources of mud or clay, plus other resources like lime, for their construction and maintenance. While essential to the maintenance and defense of communities, smithing and smelting operations also contributed to pollution, and to the processes of deforestation, wherever they were carried out.

Locating the historic sites of African technological contributions necessarily involves not only archival research, but also the active participation of archaeologists, and other specialists, trained in the recovery of African-related habitation, and industrial remains. African slave and free communities typically resided in small wooden, or mud structures arranged around a common courtyard area, in which most of the daily activities took place outdoors. Work sites were most often of the edges of habitation sites, sometimes a 15-20 minute walk, usually near a stream or other water source. The sites of iron-working are most easily identified, not by the confluence of available resources, but rather by the almost indestructible evidence of iron working in the form of slag, the unwanted byproduct of smelting or smithing. The presence of African metallurgist can further be identified by caches of empowerment objects, intentionally buried or placed in a smithy hearth, furnace, or near a smithing site.

Charcoal production undoubtedly had the greatest impact on the landscape prior to the use of coal in American industries. Charcoal fuel required dense hardwood, which was long burning,

could achieve high temperatures (up to 1400º C), and contributed to the smelt important high silica and alkali contents. Even the selected cutting of hardwoods quickly deforested the areas surrounding iron-working sites. Evidence from African industrial sites suggests a regional rate of 18,000 trees were lost annually by each specialist community. Catchment areas were limited by the walking distance across which sacks or basket loads of charcoal could be hauled, without an excessive loss of charcoal pieces to dust. In West Africa, this distance was about 25 kilometers. The regional development of charcoal production and long distance trade networks would have followed the initial deforestation.

Forests provided more than fuel for industry, raw materials for building, medicines, and firewood for household use. In areas where cutting was actually controlled by Africans or their descendants, a common practice was to create a sacred forest, in order to preserve a place in which the living could interact with spirits and ancestors. Trees within West African sacred forests were controlled by the chief, king, or clan leader. Protected by traditional sanctions, these trees were never cut—even in colonial periods.

African Blacksmiths: Iron as Master and Slave

Conceptually, the meanings associated with iron provided a contradictory consciousness that pervaded life in the colonies. Iron was both master and slave. That is, the role of iron technology was perceived by all to be a force that supported and maintained the status quo: slave society. Thus, iron was central to life onboard slave ships. Iron was used on ships for the transport of slaves, for weapons used in enslavement, slave shackles, chains, and implements of cruelty and torture, as well as for tools supporting economic enterprises essential to the functioning of slave society.

Yet, iron also played a role in resistance. Slaves used the meaning of iron to develop a basis for their own psychological freedom and empowerment. Maroon societies were established throughout the Americas, using African cultural beliefs and technological expertise. The contradictions embodied by Ogun's duality were especially apparent in slave societies and on plantations, but they would shape the attitudes about African technology's place in the American landscape.

Notes

1. Cyril Stanley Smith, "The Interpretation of Microstructures of Metallic Artifacts," in *Application of Science in Examination of Works of Art* (Boston: Boston Museum Publications, 1965), 20.

2. Henry John Drewal, "Yoruba Body Artists and Their Deity Ogun," in *Africa's Ogun: Old World and New,* Sandra T. Barnes, ed. (Bloomington and Indianapolis: Indiana University Press, 1989), 243.

3. Candice L. Goucher and Eugenia Herbert, "Gender and Technology in African Ironmaking," in *The Culture of African Iron Production,* Peter Schmidt, editor (Gainesville: University of Florida Press, 1996). See the video by Candice Goucher, Eugenia Herbert, and Carlyn Saltman, *Blooms of Banjeli: Technology and Gender in West African Iron-Making* (Watertown, MA: Documentary Educational Resources, 1986).

4. S. Terry Childs, "Style, Technology, and Iron Smelting Furnaces in Bantu-Speaking Africa," in *Journal of Anthropological Archaeology* 10(1991): 353.

5. The streets of Old San Juan, Puerto Rico, as an example, are paved with the blueish-green silica slags.

6. Candice L. Goucher, "Stoking the Furnace, Sailing the Seas: Sailor Bands in Trinidad Carnival" (paper presented at the Atlantic Rim Performance Art Panel, Twelfth Triennial Symposium of the Arts Council of the African Studies Association, St. Thomas, VI, April 25-29, 2001).

7. Idem, personal communication with Walter Landgraf, Stone Museum, CT, May 8, 2000.

8. Reported in Robert B. Gordon, *American Iron, 1607-1900* (Baltimore and London: Johns Hopkins University Press, 1996), 34.

9. Gordon, *American Iron, 1607-1900,* 118.

10. Colleen E. Kriger, *Pride of Men: Ironworking in 19th Century West Central Africa* (Portsmouth, NH: Heinemann, 1900).

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